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April 1999

ISOE INFORMATION SHEET

WORKSHOP ON IMPLEMENTATION AND MANAGEMENT OF THE ALARA PRINCIPLE IN NUCLEAR POWER PLANT OPERATIONS

IAEA, Vienna, 22-23 April 1998

IAEA Technical Centre - Information Sheet No. 4

Application of the principle of optimization of protection and safety is a principal requirement of the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (BSS), which state that “...*protection and safety shall be optimized in order that the magnitude of individual doses, the number of people exposed and the likelihood of incurring exposures all be kept as low as reasonably achievable, economic and social factors being taken into account...*”.

While this principle of optimization, or the ALARA (as low as reasonably achievable) principle, is well known and accepted by health physicists in general, without personal commitment to optimization by people in management positions, its application will not be fully effective.

A Workshop was therefore organized by the IAEA for senior managers of nuclear power plants and utilities as well as senior staff from regulatory authorities on reasons for, and means of, keeping radiation doses to workers as low as reasonably achievable. After an introduction to the health effects of radiation exposure and the conceptual framework for radiation

protection, the agenda included examples of ALARA implementation in nuclear power plants as well as approaches to application of the optimization principle in utilities and regulatory authorities. The Workshop was concluded by group discussions.

The Workshop was organized under the IAEA Technical Co-operation Project RER/9/048 on Improving Occupational Radiation Protection in Nuclear Power Plants in Central and Eastern Europe and in the former Soviet Union. It was also supported by the Department of Nuclear Safety. The purpose of this ISOE Information sheet is to provide the ISOE participants with a brief Summary of the Workshop, excluding the introductory part on health effects of radiation exposure and the conceptual framework for radiation protection. A Report from the meeting, aimed at managers, is available in English, French, Russian, Spanish and Chinese. The complete material from the meeting, i.e. papers in English and transparencies in English and Russian, is available on diskette, upon request, from the IAEA Technical Centre.

COMMITMENT TO ALARA ON THE PART OF REGULATORY AUTHORITIES AND MANAGERS

The optimization principle will not be efficiently or effectively applied at nuclear power plants unless all those concerned are fully informed of the reasons for it. Only then may optimization become an integral part of their commitment, integrated into day to day practice for all individuals concerned. Optimization of protection will be an explicit objective of the work and the results of its application could be a performance indicator.

However this cannot occur unless there is an actual and clear commitment from the top and intermediate managers in the utilities and plants to set up a corporate ALARA policy and to provide their staff with clear objectives, appropriate incentives and adequate technical and financial means. It is therefore essential that there are regulations applying the optimization principle and a clear commitment of the regulatory authority to enforce the implementation of the regulation through encouragement of informal contacts as well as through formal inspections and procedures.

Commitment of regulatory authorities

The commitment of any regulatory authority starts with the integration of the optimization principle into the national regulations, normally as a general requirement imposed on the licensee, but without defining any precise procedure to achieve it and without setting up specific dosimetric objectives.

This commitment of the regulatory authority will become real and efficient when it is able to verify the actual application of the principle. Such verification may be difficult since the expected results are not easily quantified. While the legal framework for conventional administrative law is, in most countries, based on the concept of a threshold and therefore suits the legal control of the principle of dose limitation, it is not directly applicable to the application of the optimization principle. The application of this principle generally relies on the more flexible techniques of encouragement and consultation. In this process the regulatory authority could, however, ask the operator the quite powerful question: Demonstrate to me that you have done all that is feasible to reduce exposures.

The regulatory authority may oblige the operator to establish a programme for optimization of protection (ALARA programme), including, for example, periodic estimations of the evolution of collective dose and individual dose distributions, taking into account the envisaged protective measures by the operator. It also needs to confirm that a radiation protection culture is promoted in the licensee organization: by holding the company management responsible for allocating the necessary resources to apply the optimization principle; by verifying that short- and long term collective and individual dose objectives are clearly set and widely publicized within the organization; and by ensuring that dosimetric results and feedback from experience are regularly followed up.

Commitment of managers

As pointed out by one representative of a regulatory authority during the Workshop, “The head of the plant is viewed as the main person responsible for radiation protection as well as safety. He or she is responsible for integrating optimization of radiation protection and nuclear safety considerations.” These responsibilities need to be accompanied by allocation of adequate resources and clearly delineated responsibilities at all levels of the company.

Many different groups of workers are concerned directly or indirectly with occupational radiation protection and optimization of protection: not only health physicists and those who work in an environment where ionizing radiation is present but also those preparing the inspections or maintenance tasks, those planning the different tasks, those designing the installations and any modifications, and those preparing for the dismantling of the equipment concerned. Also all those who operate the plants (chemists, operators) may have a crucial influence on the ambient radiation exposure conditions (on dose rates or contamination levels) and on the working time needed in the different radiological environments. Those who ask for tasks to be performed (inspections, control) also need to be concerned with the resulting occupational exposure. It is very important that the management defines clearly the responsibilities of all these groups of workers in a Utility or Plant Radiation Protection Code of Practice issued by the manager and defining the plant policy regarding radiation protection in general and application of the principle of optimization in particular.

One plant manager stated that in addition to a clear scope of responsibilities, the identification of the requirements for training on radiation protection is also an important component of the Plant Code of Practice. “The employees may not be expected to responsibly comply with the radiation protection requirements if they are not aware of the possible harm generated by ionizing radiation, the way of protection and the organizational and technical measures taken to minimize the effects of the radiation exposures”.

The Plant Radiation Protection Code of Practice should also include the use of Radiation Work Permits as a means for approving different tasks involving radiation exposure. In addition to facilitating control and limitation of the individual dose, the Radiation Work Permit will declare the necessity of the work, certified by the appropriate manager in the operational or maintenance organization depending on the anticipated exposure to ionizing radiation.

Another important responsibility of the management is to set up short- and long term dosimetric objectives at the plant level and at task levels, through appropriate managerial

procedures, and to possibly reward the achievement of these objectives. The management also need to provide the resources (human, technical, financial) necessary to achieve the dosimetric objectives agreed upon.

As stated by another plant manager: “In the area of radiation protection, as in many other areas, nothing moves forward without the strong personal commitment of managers, without setting objectives, without verifying results...We must never forget the importance of these two elements: a general policy and a close working relationship with workers... To create the necessary motivation and make it dynamic, managers must demonstrate that they recognize concrete actions taken to achieve ALARA, which contribute to positive results.”

ALARA IN PRACTICE : THE ROLE OF WORK MANAGEMENT AND THE FEEDBACK OF EXPERIENCE

Several examples of the practical application of the optimization principle in French, Hungarian and Slovakian nuclear power plants were presented at the Workshop. All speakers stated that, in order to achieve reasonably low doses, it is mandatory to start the planning process for major maintenance or decommissioning works several months, or even years, in advance and to include dose estimations right from the beginning of that process. They also pointed out that these estimations, as well as the definition of protection options, ought to involve not only plant health physicists, but also plant job supervisors and, very often, representatives of the contractor who will perform the work.

The speakers also pointed out the importance of regular analysis of feedback: “After the job was finished, it was felt that a formal meeting was necessary to discuss the lessons learned, among all parties involved. The main reason for this was the big difference between the estimated and the actual dose.”

The lessons learned from feedback show how essential it is to have good planning of the work, taking into account proper scheduling of successive works in one area, adequate scaffolding, servicing and insulation works, including knowledge of available space, good preparation of tools, improvement of light, and training on mock-ups. All these factors contribute to avoiding mishaps or the need to repeat tasks which would lead to unnecessary exposure. “For many jobs there is a big room for improvement through better planning and work preparation”. The examples presented showed reduction of doses by a factor of two to three with proper work preparation including, when possible, analysis of feedback from previous works.

These practical examples pointed out that, in the first phase of implementation of an ALARA programme, it is possible to save both doses and money, and that most investments made to reduce doses would be quickly offset by savings in operating costs due to better performance of the work. In order to achieve this, health physicists and plant managers participating in the Workshop agreed that:

“Since maintenance department priority is to get the job done with the least constraints and since job preparation and planning usually have to be done at very busy moments, it is the role of plant management, not of Radiation Protection staff, to promote the involvement and motivation of the job planners and performers, and to make them understand that schedule, quality, economy and optimization are not only compatible but often synergistic factors.”

CONCLUSIONS

In the summary of the final Group discussions it was emphasized that the aggregated detriment due to exposure of workers in nuclear power plants provides the basic motivation for reduction of doses well below the regulatory limits.

From other points of view the participants had, however, different starting points for the discussion. The status of application of the optimization principle differs as do the available financial resources, the available technical tools and dosimetry systems, the regulatory and legal background, as well as the individual attitude to optimization, depending on whether the participant was a representative of a plant or of a regulatory authority.

It was concluded that the Workshop offered a possibility for international comparison or benchmarking. It also promoted a better understanding of management responsibilities regarding personal involvement and setting of priorities. On the basis of the Workshop, the participants would be able to assess their position regarding application of the ALARA principle. They would also be able to judge what they can do to facilitate and improve both this process and the education of staff at different levels in the organization. The participants got useful contact points for sharing future experience. It was also emphasized that international co-operation programmes, such as the Information System on Occupational Exposure (ISOE), are essential for the information exchange and analysis of feedback on experience, as are regular meetings of Health Physics Groups.

The different roles of regulatory authorities and utilities were discussed. While the responsibility for the application of the optimization principle rests with the utility, it is essential to include the principle in regulations. The regulatory authority also need to be able to evaluate its implementation in general although not in detail.

ALARA has been described as a way of thinking, a culture or an attitude. Since national cultures are different, the most effective implementation strategies may also be different. It was pointed out, however, that in some respect there is no choice; history has shown that workers may not tolerate hazards that can be reduced at reasonable costs. The IAEA can assist its Member States in this process in different ways, this Workshop being one of them, but success or failure depends on each individual and his or her individual commitment.